U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF THE VIROQUA AREA, WISCONSIN.

BY

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[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized into the Bureau of Soils.]

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LOCATION AND BOUNDARIES OF THE AREA.

The Viroqua area lies within the limits of townships 12 to 18 north and ranges 3 and 4 west, inclusive, and contains approximately 504

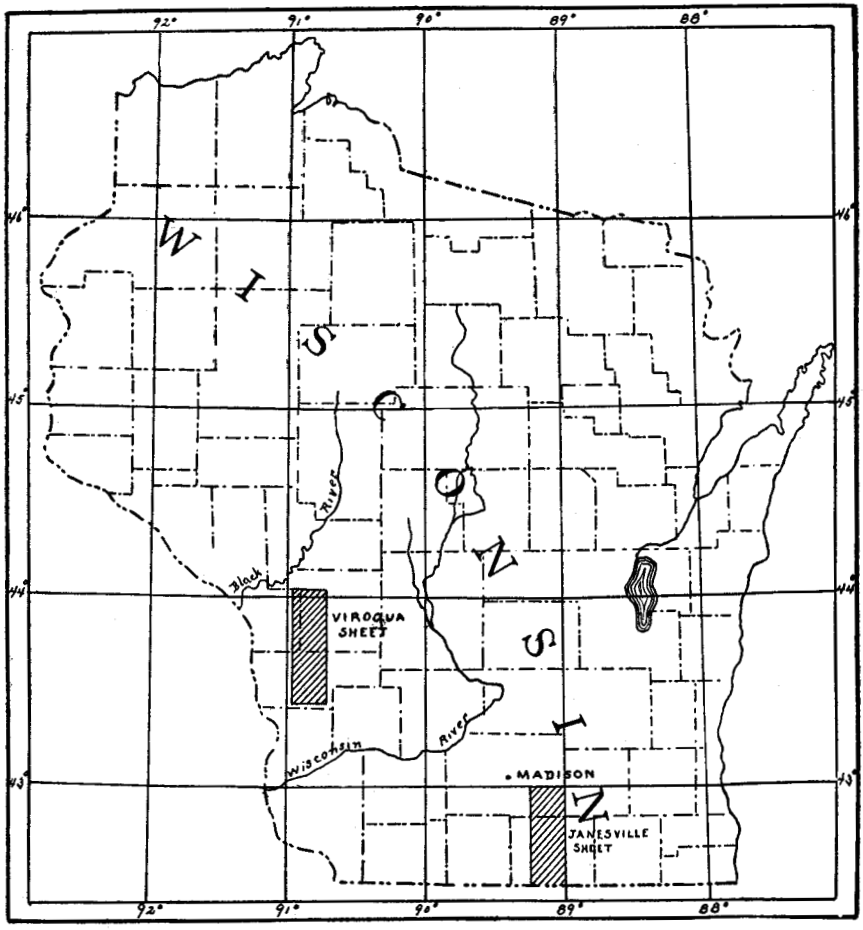

FIG. 1.—Sketch map showing position of the Viroqua area, Wisconsin.

square miles. About equal parts of this territory lie in Vernon and Monroe counties. The Mississippi River is about 15 miles distant to the west.

The southern part of the area comprises an important tobacco section, of which the city of Viroqua—the county seat of Vernon County—is one of the principal business centers, while the northern part includes a district devoted to the extensive cultivation of small fruit. Sparta, the county seat of Monroe County, is the principal town in the fruit-growing section.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The Viroqua area forms a part of the territory visited during the middle of the seventeenth century by French missionaries and fur traders. It was not until 1832, however, that an event took place which resulted in the first real settlement of this part of the country. In that year the army of General Atkinson marched through the area in pursuit of Black Hawk's band of Indians, defeating them in battle near the southwestern corner of Vernon County. The favorable reports of the country brought back by the soldiers led to rapid immigration into the eastern part of the State, and by 1844-45 the first settlement was made in this area, near Liberty.

During the period from 1851 to 1861 a great many settlers came into the area, laying the foundation for the present cities of Viroqua and Sparta and some of the smaller towns. In the southern part of the area the present population is composed largely of Norwegians, with a fair proportion of Germans, Irish, and Bohemians, all noted for their thrift and prosperity. The northern part of the area is populated principally by descendants of American settlers who came from New York and the New England States. They also are a thrifty, well-to-do class.

From the first, farming has been the principal industry of the area. Wheat was the principal money crop from 1851 to 1863, but with a decline both in the price and in the yield, the acreage gradually became less and less. The growing of corn and stock raising next became of chief importance and the latter industry has steadily increased to the present time.

During the period from 1868 to 1873 large quantities of hops were grown, but none seem to be produced now.

About 1881 tobacco growing began to assume importance in the southern part of the area, and the acreage has steadily increased since then and is still being extended. About one-third of the tobacco grown in Wisconsin, representing a value of about $1,000,000, is produced in this section. The production of small fruits, principally strawberries, blackberries, and raspberries, began about 1884, and this interest has also grown until now about one-tenth of all the berries produced in the State are grown here. The annual value of these fruits is not far from $100,000.

Cattle and horses have long been an important part of the farm equipment and output, but sheep are of more recent introduction, as wolves and wild cats were destructive even as late as the seventies, making sheep raising unprofitable.

On the whole, the agricultural industry in this area is in a remarkably prosperous condition. The area has, of course, in common with other sections, felt the effects of periods of financial depression, but no permanent injury seems to have been sustained. During the period from 1866 to 1883 the farmers were borrowers of money, while now they are lenders. The larger proportion of the deposits in local banks belongs to the farmers.

In 1858 the Chicago, Milwaukee and St. Paul Railway passed through Sparta, and this, with the later extension of the Viroqua Branch and the building of the Chicago and Northwestern Railway, has contributed to the development of the area in no small measure, bringing within easy reach such markets as Chicago and the other large cities on the Great Lakes and on the Mississippi River.

CLIMATE.

The winters in this part of Wisconsin are long and severe, the temperature often falling as low as —38° F. The soil freezes to a depth ranging from 10 inches to 2 feet, the snowfall is heavy, and usually the ground is covered from December to March. In summer the temperature sometimes reaches 95° F., which gives an extreme range of 133°. The normal annual rainfall is not far from 30 inches, the greater part of which occurs in the growing season.

The following table gives the normal monthly and annual temperature and precipitation, as drawn from Weather Bureau records at three stations.

Normal monthly and annual temperature and precipitation.

Month.	Viroqua.		La Crosse.		Neillsville.	
	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.
	°F.	*Inches.*	°F.	*Inches.*	°F.	*Inches.*
January	14.1	1.14	14.7	1.28	10.0	1.22
February	17.7	1.25	20.0	1.11	14.6	1.15
March	29.2	1.80	30.8	1.58	26.2	2.00
April	46.6	1.80	47.4	2.26	46.2	3.00
May	58.7	4.00	59.4	6.29	56.8	4.01
June	69.0	4.70	68.9	4.47	67.0	4.45
July	72.0	4.00	71.1	4.07	69.8	3.20
August	69.8	3.10	70.1	3.27	67.0	2.10
September	62.0	4.00	61.6	4.22	59.5	2.85
October	49.8	2.30	49.5	2.24	47.5	2.20
November	33.7	1.63	34.4	1.45	30.5	1.60
December	24.0	1.50	23.6	1.44	15.2	1.40
Year	43.9	31.22	46.0	30.69	42.7	28.18

The length of the growing season varies from about 127 days at Neillsville to 152 days at La Crosse, the first killing frost in fall occurring on October 2 at La Crosse, October 3 at Viroqua, and September 17 at Neillsville, and the last in spring May 3, May 5, and May 13, respectively, for the same stations.

PHYSIOGRAPHY AND GEOLOGY.

The surface of the Viroqua area is very hilly—a conformation due mainly to active stream erosion in what was once a comparatively level plain. The upland is dissected by ravines, or coulées, 15 to 50 feet deep, which ramify in all directions, leading into stream valleys. The declivities along these and along the streams are usually precipitous and the valley bottoms lie from 50 to 200 feet below the general level of the upland. These surface features are particularly marked in the southern four-fifths of the area, and the soils are there mostly silty loams in texture. The northern part of the area, which is largely made up of the valley of the La Crosse River, consists of rolling and flat valley lands, chiefly of sandy loam and sandy soils.

The upland lies from 1,100 to 1,400 feet above sea level; the stream bottoms from about 800 to 1,100 feet elevation, the La Crosse Valley being the lowest.

The city of Cashton lies near the divide, the drainage from this point being southward through many streams into the Kickapoo River, and northward through small streams leading into the La Crosse River and other streams running east and west and emptying finally into the Mississippi River.

Geologically the greater part of the area consists of a stratum of loesslike material from 5 to 50 feet or more thick, resting on rocks consisting of horizontal layers of magnesium limestone and St. Peter and Potsdam sandstones. The limestone and the Pottsdam sandstone are used for building. The St. Peter sandstone is loose and incoherent and contributes the greater part of the material of the lighter soil types. The larger streams have usually cut from 40 to 150 feet into the rocks.

The loess covering so great a part of the area is almost entirely wanting in the La Crosse Valley, and the soils there are derived largely from the country rock, the material having been reworked by the streams.

SOILS.

Eight soil types, including Meadow, were recognized in the Viroqua area. Most of them have been mapped in other areas.

The following table gives the area of each type of soil in the Viroqua area:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Miami silt loam	201,408	62.5	Miami sandy loam	16,064	5.0
Miami sand	28,288	8.8	Meadow	7,104	2.2
Miami loam	23,552	7.3	Sioux sandy loam	5,568	1.7
Marshall silt loam	20,864	6.5	Total	322,368	.....
Sioux sand	19,520	6.0			

MARSHALL SILT LOAM.

The Marshall silt loam consists of from 10 to 20 inches of a dark brown or black silty loam, underlain to a depth of 36 inches or more with a yellow silty clay. There is little or no trace of sand in the soil, the texture in the field being of a pronounced silty character.

The type is of relatively small extent, and occurs in the upland in the southwestern corner of the area. The surface is usually moderately rolling, though occasionally decidedly hilly, and the elevation ranges from 1,100 to 1,300 feet above sea level.

This soil is well drained naturally, and there are but few areas needing artificial drainage. While the rolling surface of the country and the texture of the soil provide good drainage, sufficient moisture seems to be retained to prevent the injury of crops by drought except at rare intervals.

The Marshall silt loam represents the weathered product of the sheet of loesslike material already referred to. The black color of the surface soil would seem to indicate that the type once formed the bottom of a shallow lake or swamp, when large quantities of vegetable matter accumulated and decayed, or it may be that the black mold accumulated from the growth and decay of prairie grasses. The type is locally known as "black prairie land." The soil contains considerable quantities of organic matter and is naturally productive, and this property has been husbanded through careful cultivation.

The chief crops are small grain, corn, grass, sorghum, and forage. These all produce very well. Tobacco is also grown, and yields about 1,200 pounds per acre. The yield of wheat is about 20 or 25 bushels per acre, of oats about 60 or 70 bushels, of hay 1 or 2 tons. The fodder crops yield from 6 to 20 tons per acre green, or from 4 to 10 tons dried. Large quantities of fodder crops are put up in silos.

The Marshall silt loam seems very well adapted to these crops. The tobacco is not so good as that grown on some of the other soils, but still brings a good price.

Practically all of this soil is under some form of cultivation. Its value ranges from $60 to $100 an acre, with a considerable proportion of the area held at $80 an acre.

The following table of mechanical analyses shows the texture of samples of the soil and subsoil of this type:

Mechanical analyses of Marshall silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
8674	2 miles N. of Viroqua.	Black loam, 0 to 20 inches.	3.61	0.00	0.10	0.18	0.90	8.84	82.54	7.06
8672	2 miles S. of Viroqua.	Black silty loam, 0 to 12 inches.	2.29	.00	.08	.10	.36	7.52	78.50	13.16
8675	Subsoil of 8674.....	Brown silty clay, 20 to 36 inches.	.11	.00	.10	.10	.34	10.66	79.80	8.14
8673	Subsoil of 8672.....	Brown silty clay, 12 to 36 inches.	.84	.00	.04	.04	.30	10.66	76.94	11.22

MIAMI SILT LOAM.

The Miami silt loam consists of from 3 to 8 inches of brown silty loam, underlain by a yellow, very silty clay often several feet in depth. The type differs from the Marshall silt loam in having less depth of soil and in having less organic matter and a lighter color, the subsoil of both types being identical. It is locally called "clay land" in distinction from the "black prairie land," or Marshall silt loam.

The Miami silt loam includes most of the loessial area, reaching from Viroqua to and beyond Leon and covering nearly three-fourths of the area surveyed. The surface of this area is very hilly. Many valleys from 50 to 150 feet below the level of the plateau occur, and these have frequent tributary ravines and coulées reaching far into the upland on each side. The upland parts of the area are from 1,100 to 1,400 feet above sea level.

By reason of its hilly surface the type is naturally well drained. Occasionally some of the fields are washed and gullied, but the extent of such damage is small compared with that in similar lands in more southern States. The fact that the annual rainfall is only about half as much here as in the Southern States possibly explains the difference.

Like the Marshall silt loam, the Miami silt loam originated from weathering of the extensive sheet of loess covering the greater part of the area surveyed. The conditions were not as favorable, however, for the accumulation of organic matter as in the case of the former type.

The same crops are grown as on the Marshall silt loam, and with about equal success. The soil seems adapted to the production of a thinner leaf tobacco. This crop yields from 1,000 to 1,200 pounds per acre. The southern slopes of the hills are considered the best situations

for the tobacco fields. The ravines, or coulées, are also well adapted to the production of both small and tree fruits. Strawberries, raspberries, and blackberries produce better and longer in these situations than anywhere else in the area. The northern slopes are especially adapted to the growing of apples, cherries, and plums, because the tendency to blossom early is checked and the danger of damage from late spring frosts lessened. In the case of the small fruits the bushes and vines are bent down and covered with soil in the fall, which need not be removed until late in the spring, when all danger from frost is past. For such fruits either a north or south slope may be used. The ridges and upland flats are used chiefly for small grain, corn, and forage crops, since horsepower machinery can be successfully used there.

At present tobacco is the principal special crop on this soil type, but there will probably be a considerable extension of the small-fruit and orchard-fruit industries in the future.

A large proportion of the type is under cultivation. Some of the more hilly areas, however, are yet covered by forests of oak. The market value ranges from $25 to $100 an acre, while a large part of it is held at about $75 an acre. Prior to the introduction of tobacco and small-fruit interests the more hilly portions brought only $5 or $10 an acre.

The following table of mechanical analyses shows the texture of samples of this soil type:

Mechanical analyses of Miami silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
8662	5 miles E. of Viroqua.	Brown silty loam, 0 to 6 inches.	3.03	0.24	2.42	4.06	6.68	5.32	70.12	11.16
8680	¼ mile N. of Cashton.	Rich dark loam, 0 to 8 inches.	1.64	.10	.56	.70	1.46	9.50	73.08	14.60
8681	Subsoil of 8680.....	Brown silty clay, 8 to 36 inches.	.60	.02	.20	.20	.58	13.26	71.84	13.90
8663	Subsoil of 8662.....	Yellow silty clay, 6 to 36 inches.	1.67	.36	1.72	3.20	4.82	4.84	69.70	15.32

MIAMI LOAM.

The Miami loam occurs as bottom land along the streams flowing through the silty loam area. It consists usually of 2 or 3 feet or more of black silty loam, underlain by a stratum of broken rock and sand. Occasionally the texture of the surface soil becomes somewhat sandy and in other places mucky. The greater part of the type, however, has a texture similar to that of the silty loam upland, and the areas lie high enough to admit of cultivation.

The surface is usually flat. Sometimes the type forms part of the lower slopes, and occasionally is found as a higher terrace, 5 to 15 feet above the stream. The valley slopes are usually quite steep, and the margin of the Miami loam is therefore quite well defined.

During the normal flow of streams this soil is very well drained. It is sometimes overflowed during long-continued and excessive rainfall, but such occurrences are not very frequent.

The type has been derived from stream-deposited material brought largely from the silty loam upland. Erosion and weathering of the sandstones have in some instances given the slightly more sandy texture already referred to. Such occurrences are found usually next the valley slopes, where the St. Peter sandstone outcrops. By reason of its location the type contains a relatively large proportion of humus.

Corn, grass, and forage crops do very well on this soil. In good seasons corn yields from 40 to 100 bushels per acre, hay from 1 to 3 tons, and fodder corn from 4 to 10 tons, dry matter, per acre. Wheat, rye, and other grains yield well, but are subject in some instances to rust, and because of the heavy growth of straw often lodge badly. Tobacco yields from 1,100 to 1,400 pounds per acre.

The type is very well adapted to the crops just named, and the margin of the type next the valley slopes, where the soil is often sandy, is especially adapted to the growing of tobacco, which gives a fine, thin leaf. Where a southern exposure is obtainable, this is also of advantage in tobacco culture on this type. The relatively small proportion of the type at present too wet for cultivated crops is well suited for permanent pasture.

Most of the Miami loam is under some form of cultivation. The remainder supports a growth of alder, willow, and swamp grass. Many homesteads are located on this type.

The following table gives mechanical analyses of samples of this soil:

Mechanical analyses of Miami loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
8676	4 miles N. of Cashton.	Black loam, 0 to 20 inches.	2.77	0.18	1.94	7.80	40.60	19.46	25.44	4.58
8678	1 mile SE. of Ross ..	Black silty loam, 0 to 20 inches.	5.32	.04	.36	.28	7.50	19.06	65.60	6.44
8677	Subsoil of 8676.....	Black sandy loam, 20 to 36 inches.	1.36	.40	4.90	15.20	48.48	17.08	10.74	2.88
8679	Subsoil of 8678.....	Silty clay loam, 20 to 36 inches.	1.54	.12	.90	.46	4.62	14.72	69.76	9.14

MIAMI SAND.

The Miami sand is a deep yellowish-brown medium to coarse sand, not unlike the Norfolk sand in texture. The first 8 inches is sometimes darkened by accumulated organic matter. The texture of soil and subsoil is very similar. Rarely there is a trace of clay in the subsoil, but usually it is loose and sandy.

The type occurs on both sides of the La Crosse River Valley on the higher ridges and slopes. The surface is usually quite hilly, but broad, easy slopes are not infrequent. The texture and location of this type give it good drainage. Still, for such a sandy soil, it does not seem excessively droughty. It may be that there is subirrigation from the neighboring and higher lying Miami silt loam. The original source of the materials composing the Miami sand is the sandstones which underlie the whole area. The loose-textured St. Peter sandstone has doubtless contributed more largely than the other sandstones. Stream erosion has probably been the principal agency in the formation of the type. The loess material, if it ever covered the area, has been washed away.

The principal mineral constituent is quartz, and the yellowish-brown stain is probably due to iron salts, which are believed to be prominent in the seepage waters of the area.

Some portions of the Miami sand produce fair crops of rye, corn, oats, root crops, and strawberries, but the land must be well manured to insure crops, and even then the yield is from 15 to 40 per cent below that of the heavier soils.

The following table of mechanical analyses shows the texture of this type:

Mechanical analyses of Miami sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
8656	2 miles SW. of Sparta.	Loose brown sand, 0 to 8 inches.	1.30	0.06	6.70	22.74	56.00	3.68	7.34	3.48
8654	9 miles NW. of Sparta.	Loose yellow sand, 0 to 6 inches.	1.61	.14	9.44	35.10	44.60	1.86	4.76	3.98
8655	Subsoil of 8654.....	Loose brown sand, 6 to 36 inches.	.54	.18	9.24	34.60	48.50	1.60	2.60	3.28
8657	Subsoil of 8656.....	Loose yellow sand, 8 to 36 inches.	.76	.20	9.02	29.84	49.40	2.24	5.64	3.66

MIAMI SANDY LOAM.

The Miami sandy loam consists of 8 or 12 inches of yellowish-brown sandy loam, underlain to a depth of 24 inches with a sandy clay loam, usually reddish-brown in color and very compact. Beneath this usually occurs a loose, yellowish coarse sand, which in some cases rests on sandstone. The underlying rock is not far below where the type occurs on steep slopes, but where the slopes are easier, as along the foot of the hills, it lies much deeper.

The type occurs principally on the slopes bordering the La Crosse River valley. Usually the inclination is not very steep and cultivation is not difficult.

By reason of its surface slope and physical construction the type is naturally well drained, while at the same time sufficiently retentive of moisture to prevent injury to crops during ordinary dry spells.

In the first 2 feet of the Miami sandy loam the soil seems to have resulted from a mixture of the loose yellow material of the Miami sand and the silt and clay materials forming the Miami silt loam. The type is a constant and characteristic feature of the Viroqua area, wherever the sandy valley lands and the heavy-textured uplands are found near together.

Corn, grain, and grass, vegetables, and small fruits are grown quite successfully on this soil type, which needs to be manured and enriched with the legumes in order to produce paying crops. The type is best adapted to an annual crop. Such crops as raspberries, plums, and apples, while they may do well under some circumstances, do not as a rule produce so long nor so heavily as on the Marshall silt loam, or Miami silt loam. Of the fruits, strawberries do best. The type is regarded as one of the more desirable sandy soils of the area.

The following table of mechanical analyses shows the texture of soil and subsoil of this type:

Mechanical analyses of Miami sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
8658	6 miles NE. of Sparta.	Brown sandy loam, 0 to 6 inches.	0.86	0.08	14.06	26.42	33.92	3.16	15.56	6.46
8660	2 miles W. of Sparta.	Brown sandy loam, 0 to 10 inches.	1.67	.06	10.74	22.00	30.84	3.72	24.40	7.70
8659	Subsoil of 8658....	Brown sandy loam, 6 to 36 inches.	.29	.16	13.32	25.28	34.62	3.34	16.54	6.52
8661	Subsoil of 8660....	Brown sandy loam, 10 to 36 inches.	.47	.18	8.34	20.24	27.68	3.00	26.60	13.88

SIOUX SAND.

In texture and material the Sioux sand is very similar to the Miami sand, the chief differences in these types being in the position and in the proportion of organic matter contained. The Sioux sand forms flat valley lands and is dark colored from the presence of decaying vegetable matter. The surface soil consists of from 5 to 20 inches of loose, medium to coarse textured quartz sand, while the subsoil is a loose yellowish-white sand, similar in texture to the soil, extending to a great depth. In some cases the subsoil contains enough clay and silt to change the texture slightly, but as a rule these materials are not present in any considerable proportion.

The areas of this soil occur as flat lands in the valleys and lie from 5 to 10 feet above the mean level of the streams. They seldom extend more than 1 mile away from the streams. In the present survey this type of soil is found mainly in the level floor of the La Crosse River Valley.

The soil is well drained naturally and is seldom subject to overflow. Areas which occur in narrow valleys flanked by high uplands maintain a supply of water sufficient for the crops throughout the season, and such areas are usually cleared and cultivated. The part of the type lying as broad areas in the wider valleys, however, are inclined to be droughty and are covered with a rather scrubby growth of pine and oak. During high water in the streams the type becomes well moistened, but as the streams fall it rapidly loses the water and crops are liable to be injured.

The type owes its origin to the erosive action of the stream on the underlying St. Peter and Potsdam sandstones. Lying as it does comparatively flat, and at times probably having been quite wet, this soil in the past has supported a growth of water plants sufficient to accumulate in places considerable organic matter, which has stained the surface soil quite black.

On the areas of this soil occurring in the narrow valleys, where the moisture conditions are best, the staple crops, vegetables, and strawberries are successfully produced. Where properly fertilized from 40 to 80 bushels of corn per acre are obtained. The small grains yield in like proportion, but such high yields, taking the type as a whole, are unusual. The greater part of the type, in its present state, is unsuited to agriculture, and the extensive use of it depends on some practicable method of irrigation. Cranberries are successfully produced where the land can be flooded. When irrigation shall be resorted to, as at present where the soil is naturally irrigated by seepage waters, vegetable crops, cranberries, and small fruits, as well as corn, grain, the grasses, and forage crops can be successfully grown. In its present condition much of the type is regarded as waste land,

and worth only from 50 cents to $1 an acre. The more productive areas are held at from $5 to $20 or more an acre.

The following table shows the texture of this type:

Mechanical analyses of Sioux sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
8636	4 miles SW. of Sparta.	Loose black sand, 0 to 24 inches.	1.07	0.12	6.14	25.02	55.54	4.16	4.36	3.90
8664	7 miles NE. of Sparta.	Loose black sand, 0 to 6 inches.	2.38	.40	14.24	30.66	43.52	1.12	5.58	4.36
8667	Subsoil of 8666....	Loose yellow sand, 24 to 36 inches.	.34	.16	8.50	28.96	54.40	3.58	1.86	2.24
8665	Subsoil of 8664....	Loose sand, 6 to 36 inches.	.76	.24	10.68	35.14	45.88	.86	3.50	3.70

SIOUX SANDY LOAM.

The Sioux sandy loam, like the Miami sandy loam, apparently results from the intermingling of the materials of two or more extensive soil types—in this case of the Sioux sand and the heavier silty clay upland types. To a depth of 8 or 10 inches the soil consists of a black sandy loam. Beneath the surface soil and extending to a depth of about 24 inches, is found a brownish-black sandy clay loam often very compact. This usually rests on a loose yellowish-white sand of considerable depth. The composition and profile of the type are much the same as those of the Miami sandy loam, and the differences between the two are found chiefly in the content of organic matter and in the topography.

The areas of Sioux sandy loam generally lie in the valley floor between the Sioux sand and the heavier soils of the upland. The surface is usually rather flat, but occasionally near the foot of the upland slope the type occurs with a gently sloping or rolling topography.

The soil is usually well drained, but the drainage is not excessive, and injury from drought is infrequent. The Sioux sandy loam has been formed through the deposition of materials derived from the sandstones and the silty clay mantle covering the upland. To these mineral components has been added a considerable quantity, varying locally, of organic matter, and it is this that gives the rich black color to the surface soil. The principal accumulation of organic matter took place when the streams were higher than they now are and when overflows were frequent. At the present time the areas are seldom or never flooded.

Of the sandy types occurring in the La Crosse Valley the Sioux sandy loam has the greatest natural productiveness. The staple crops are produced to advantage on this type. Vegetables, strawberries, and raspberries are also successfully grown, and in recent years a considerable acreage has been devoted to tobacco, which yields from 1,000 to 1,200 pounds per acre of a leaf of very good quality. With proper attention to fertilization and cultivation, the Sioux sandy loam seems adapted to quite a wide range of crops, and practically the entire area is already under some form of cultivation. The value of such land is about as high as that of any other soil in the area, ranging from $40 to $100 per acre.

The following table gives mechanical analyses of soil and subsoil of this type:

Mechanical analyses of Sioux sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
8668	5 miles NE. of Sparta.	Black sandy loam, 0 to 8 inches.	1.92	0.26	13.58	26.10	32.54	8.14	13.50	5.40
8670	½ mile W. of Sparta.	Black sandy loam, 0 to 8 inches.	3.32	.56	13.48	15.78	19.96	9.72	27.72	12.42
8669	Subsoil of 8668....	Brown sandy loam, 8 to 36 inches.	.88	.32	11.98	26.06	33.30	8.10	14.22	5.98
8671	Subsoil of 8670....	Brown sandy loam, 8 to 36 inches.	.95	.28	10.66	15.50	20.82	5.76	31.46	15.52

MEADOW.

The physical character of Meadow is in the main like that of Sioux sand, the difference being that it forms the immediate border of streams, is lower lying, and for that reason usually too wet and too frequently overflowed to be used for cultivated crops. It is used largely for permanent pasture, for which purpose it is admirably adapted. Next the streams there is a thick growth of willow and alder, which affords shade and protection to cattle. A part of the coarse wild grass growing in the Meadow is cut for hay. The yield is usually large, and the quality is said to be fair.

AGRICULTURAL CONDITIONS.

The agricultural industry of the Viroqua area is in a very prosperous condition. The recent development of the tobacco and the small-fruit interests, taken in connection with extensive stock raising and the

already firmly established general farming interests, have placed the industry in its present favorable position.

The greater number of the farms are operated by the owners, while the remainder are about equally in the hands of share and money tenants. The manager class here is not large, although it is thought to be on the increase. About one-fourth of the crop is taken by the landlord when lands are rented on a share basis, while on a cash basis the rental ranges from $5 to $10 an acre.

The average size of farms and the acreage valuation, as given by the Twelfth Census for the counties as a whole, probably represent fairly well the conditions in the parts of these counties included in the soil survey. According to that authority the average size of farms in Monroe County is a little over 131 acres and in Vernon County about 116 acres. The average acreage valuation is less in Monroe than in Vernon County, owing doubtless to the greater area of the sandy soils, which frequently have a very low value. The farms noticed in the course of the survey ranged from about 40 acres to over 640 acres, but the generality of holdings had an extent of between 80 and 240 acres.

The labor is almost entirely white. It is largely drawn from a resident class, but a part is transient, especially during the tobacco-handling and berry-picking seasons. Contracts for six months or a year generally allow the laborer from $18 to $26 a month, with board in addition. The sorting and casing of tobacco is done by both girls and men on a piece basis, the pay being about 75 cents for each 100 pounds assorted. In berry picking also the piece system is used, and the rate is usually 1½ cents a quart. On the whole, labor is quite efficient and satisfactory. Occasionally there is a scarcity during the busy harvest season, and this is the chief labor difficulty in this area.

The principal money crops of the area are tobacco and small fruits. The binder type of tobacco is grown. It brings now from 8 to 12 cents a pound. As already pointed out, the southern half of the area produces most of the tobacco, while the small fruit is grown chiefly in the northern half.

Most of the tobacco is shipped in bales to such points as Janesville, Stoughton, and Madison for casing and making into manufactured products. Several tobacco warehouses were seen in the area, the largest at Sparta, having a capacity for 600 employees during the sorting and casing season.

The products from live stock, dairy products, meat, and wool are also important sources of revenue. Considerable interest is likewise taken in poultry and bees. Quantities of cucumbers are grown in the vicinity of Sparta and sold to a pickling plant at that place.

The soils of the area fall naturally into two groups, a silty loam group including the Marshall silt loam, the Miami silt loam, and

the Miami loam, and a sandy group comprising the Miami sand, the Miami sandy loam, the Sioux sand, the Sioux sandy loam, and Meadow. The crops produced and adapted to these different soils have already been noted in the discussion of soil types, but it is thought that the importance of this part of the survey work admits of a brief recapitulation here.

The Marshall silt loam is a type well suited to the production of a wide range of crops. Corn and forage crops yield well, and tobacco and fruits are profitably grown. The tobacco from this soil is not usually quite so thin and elastic as that produced on some of the other soils, but still it is of very fair quality.

The Miami silt loam also has a wide range of adaptation, although, by reason of its lower humus content and more hilly surface, certain special crops are more prominent than on the type first mentioned. The natural productiveness is good, and the yields of all crops are large, but heavy application of manures is more necessary than in the case of the Marshall silt loam. The ravines, or coulées, in the Miami silt loam are especially adapted to the growing of small fruits, tobacco, apples, cherries, and plums, while the flatter portions, where machinery can be more easily used, are better suited to the growing of the general farm crops and vegetables. The coulées afford protection from severe winds, which are often very destructive to tobacco, and from the cold, drying winds of winter, which are less injurious to strawberries, raspberries, and fruit trees than on the higher levels. An extension of the small-fruit and orchard-fruit interests in these parts of the Miami silt loam area is now taking place.

The Miami loam is also one of the choicer, more productive soils in the area, occurring along the streams in the upland. Protection from severe winds is also had on this type, and only occasionally are portions of it subject to overflow. The staple crops, especially corn, grass, and forage crops, produce very well on this type. Along the margins, where the soil passes onto the valley slopes, there are frequently found areas containing a greater proportion of sand than the typical soil, and these areas are particularly desired for tobacco growing. A thinner and finer-textured leaf is here produced.

The Miami sand is probably the least productive of the soils of the area, yet some of it produces fair yields of grain and vegetables. It would seem to be best adapted to watermelons.

The Miami sandy loam is fairly productive of the staple crops, fruit, and vegetables, but careful cultivation and fertilization are required to keep it in a high state of productiveness.

The Sioux sand is a loose sandy soil, found largely in the level floor of the La Crosse River Valley. Those areas receiving the seepage water from the high land produce fair yields of the staple crops and

vegetables. Much of the type not so favored needs irrigation before extensive use can be made of it. Where water can be had this type is especially adapted to cranberry culture.

The Sioux sandy loam also forms a part of the level floor of the La Crosse Valley, lying usually between the Sioux sand and the heavier-textured upland types. It is the most productive of the sandy types. Corn, grain, forage crops, vegetables, and small fruit yield well on this type. Tobacco is not yet grown to any great extent, but trials indicate that satisfactory results can be obtained with this crop.

The Meadow occurs as low, wet land along the streams. It is subject to overflow, usually unfit for cultivation, but serves very well for pasture and the production of coarse hay.

The transportation facilities of the area are very good. Two important railway lines pass through Sparta—the Chicago, Milwaukee and St. Paul Railway and the Chicago and Northwestern Railway—connecting the area with the Chicago, Milwaukee, Minneapolis, St. Paul, and Duluth markets. A branch of the Chicago, Milwaukee and St. Paul Railway, known as the Viroqua Branch, extends from Sparta to Viroqua. Considerable local trading and marketing are done at Viroqua, Westby, Cashton, and Sparta, towns having populations ranging from 500 to 4,000.

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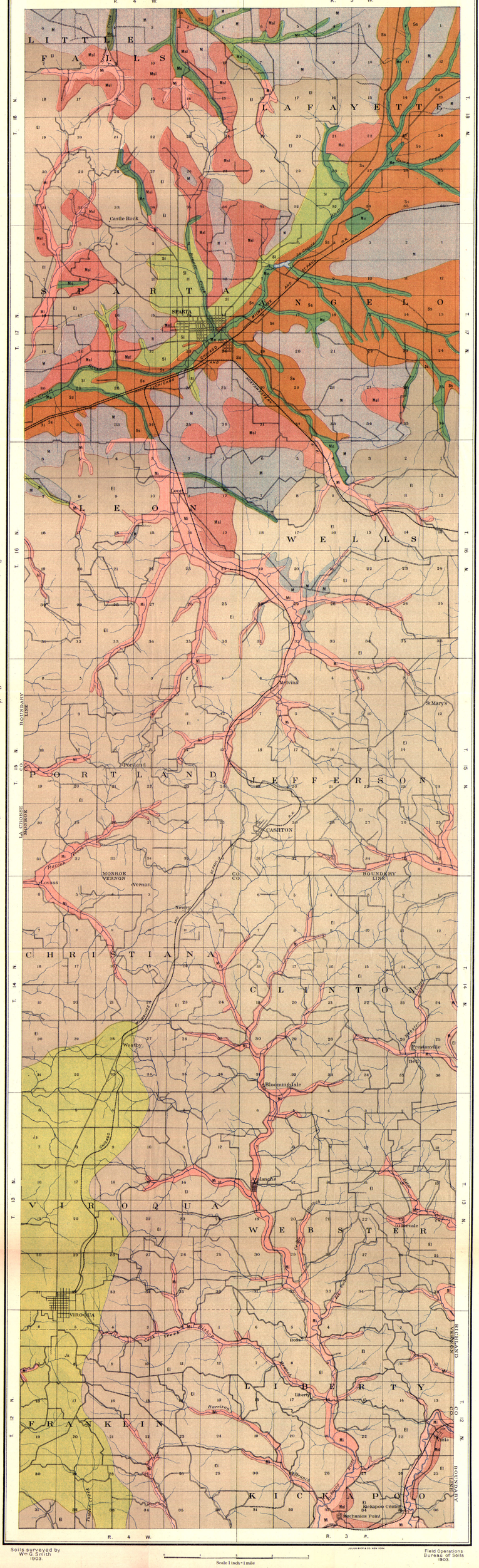
U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF.

SOIL MAP

WISCONSIN
VIROQUA SHEET



SOIL PROFILE
(3 feet deep)

- Miami sand — S
- Sioux sand — S
- Sioux sandy loam — Ssc / S
- Miami sandy loam — Ssc / Sc / S
- Marshall silt loam — Sic / Si
- Miami silt loam — Sic / Si
- Miami loam — Sic
- Meadow

LEGEND

- S Sand
- Ssc Sandy loam
- Sc Sandy clay
- Msc Clay loam and sand
- Sic Silt loam
- Si Silty clay

LEGEND

- M — Miami sand
- Ss — Sioux sand
- Sl — Sioux sandy loam
- Msl — Miami sandy loam
- Js — Marshall silt loam
- El — Miami silt loam
- Ml — Miami loam
- Md — Meadow

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Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1903.